REMARKS

Claims 7-11 are pending. Claim 10 has been amended.

The following remarks are made in response to a Final Office Action dated February 6, 2007, in which the Examiner:

rejected claim 8 under 35 USC § 112, paragraph 2, for insufficient antecedent basis;

rejected claims 7, 8 and 10-11 under 35 USC § 102(b) as being anticipated by US Patent No. 6,202,230 to Borders ("Borders I"); and

rejected claim 9 under 35 USC § 103(a) as being unpatentable over Borders I in view of US Patent No. 5,157,800 to Borders ("Borders II").

Applicants thank the Examiner for the courtesy of the telephonic interview on March 26, 2007, wherein the Applicants understanding of a parallelogram joint (with reference to paragraph [0025], FIG. 5 and claim 1) was discussed.

Applicants believe that the Examiner's rejection of claim 8 for insufficient antecedent basis is in error and that the rejection should be applied to claim 10. Claim 8 does not recite "the lower leg strut," whereas claim 10 does. Applicants have amended claim 10 to depend from claim 9, thereby supplying proper antecedent basis.

<u>Claims 7, 8 and 10-11</u>

The Examiner rejected claims 7, 8 and 10-11 as being anticipated by Borders I. Claim 7, which is the only independent claim, is directed to a leg support arrangement for an operating table. Claim 7 recites, at least in part, that each leg support is connected with the base element by means of a parallelogram joint. Each leg support includes an upper leg support and a lower leg support. The joint axes of the parallelogram joint are oriented perpendicular to the plane of the base element. Each upper leg support is connected with a connecting piece by two parallelogram joint forming links, to which connecting piece the first ends of the links are pivotally connected. The connecting piece is pivotally connected

with the base element for movement about the horizontal folding axis for the upper leg support. The second ends of the two parallelogram joint links are pivotally connected to the upper leg support onto which the folding joint for the lower leg support is formed.

Applicants respectfully submit that the ordinary meaning of the claim terms "parallelogram joint" and "links" should be applied. According to MPEP 2111.01, during examination the claims must be interpreted as broadly as their terms reasonably allow, and this means that the words of the claim must be given their plain meaning unless the plain meaning is inconsistent with the specification. The ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art. Further, the ordinary and customary meaning of a term may be evidenced by a variety of sources, including the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence. Indeed, "claims are not to be read in a vacuum, and limitations therein are to be interpreted in light of the specification in giving them their 'broadest <u>reasonable</u> interpretation'." (*In re Marosi*, 710 F.2d 799, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), internal citations omitted, emphasis in original.)

In this regard, Applicants submit that a "parallelogram joint" is a well-known type of four-bar linkage joint, in which the orientation of the coupler link remains unchanged during motion—in other words, the coupler link moves parallel to its original position. (See, for example, a Carnegie Mellon University website, <u>www.cs.cmu.edu/~rapidproto//mechanisms/chpt5.html</u>, Subsection 5.2.1 <u>Examples</u>, Parallelogram Mechanism (copy supplied) and US Patent No. 5,374,050, Abstract, et al.) Furthermore, Applicants submit that the term "link" is also well known in the art as being a rigid body connected to other links at joints, where a joint allows relative movement between the links. In paragraph [0025] of the specification in conjunction with FIG. 5, Applicants disclose that "[t]he two links 34 and 50 form with their joint axes 36, 52 and 44, 54 a parallelogram joint, by means of which the connecting member 42 and with it the upper leg plate 46 can be adjusted parallel to itself without it changing its orientation in space."

Thus, consistent with these well known understandings of the terms "parallelogram joint" and "links," the specification explicitly discloses that the phrase "parallelogram joint" used in claim 1 includes links joined at axes 36, 52, 44 and 54 such that the upper leg plate can move parallel to itself. In light of the above, Applicants respectfully request that the Examiner give the terms "parallelogram joint" and "links" their ordinary and customary meaning as evidence by the specification and the extrinsic evidence presented herein.

The Examiner has indicated that Borders I discloses that "each leg support is connected with the base element (14,16) by means of a parallelogram joint is defined by post 106 (fig. 11) wherein vertical joint axes (90, 92) (fig. 6) are oriented perpendicular to the horizontal plane of the seat section of base." The Examiner further asserts that "each upper leg support is connected with a connecting piece defined by the first frame section 88 by two parallelogram joint forming links defined by a clevis 100, to which connecting piece the first ends of the links are pivotally connected."

Applicants disagree, and respectfully assert that Borders I fails to disclose that a parallelogram joint connects each leg support to the base element. A parallelogram joint would allow the leg support to move parallel to itself relative to the base element. Borders I fails to disclose a joint that allows the leg support to move parallel to itself without changing orientation. Rather, referring to FIG. 13, Borders I discloses that each leg support 84/88 is connected to seat section 22 with a horizontal pivot joint (around axis 112), a vertical pivot joint (around post 106), and a second horizontal pivot joint (around axis 48). By themselves, or taken all together, these joints connecting the leg support 84/88 of Borders I to the seat section 22 cause the leg support to change orientation as it is moved. Thus, contrary to the Examiner's assertion, Applicants submit that the vertical pivot joint around post 106 does not constitute a parallelogram joint, as would be understood by persons of ordinary skill in the art and as defined in the specification with reference to paragraph [0025] and FIG. 5.

Applicants further submit that clevis 100 does not define two

parallelogram joint forming links. As noted above, a link is a rigid body connected to other links at joints. At most clevis 100 forms a single link, as clevis 100 is a single rigid body. Thus, it is not possible, given the ordinary and customary meaning of the term "link," for clevis 100 to define two parallelogram forming links.

Furthermore, claim 1 requires that the parallelogram joint axes be oriented perpendicular to the plane of the base element. Claim 1 also requires that each upper leg support is connected with a connecting piece by two parallelogram joint forming links, to which connecting piece the first ends of the links are pivotally connected and that the second ends of the two parallelogram joint links are pivotally connected to the upper leg support. Borders I discloses that clevis 100 pivots around a vertical post 106 and is coupled to frame section 88 via horizontal pivot axis 48 (see FIG. 13). If, *arguendo*, one were to consider the clevis 100 of Borders I to be the two parallelogram joint forming links (as indicated by the Examiner), then the parallelogram joint axes would be the vertical axis 90 (or 92) associated with vertical post 106 and the horizontal axis 48. Although vertical axis 90/92 is perpendicular to the plane of seat section 22, horizontal axis 48 is not perpendicular to seat section 22. Therefore, even if, *arguendo*, clevis 100 was considered to be the two parallelogram joint forming links (which Applicants refute), the joint axes are not oriented perpendicular to the plane of the base element, as required by claim 1.

Claim 9

The Examiner rejected claim 9 as being unpatentable over Borders I in view of Borders II. Claim 9 depends from claim 7 and contains additional recitations thereto. Applicants respectfully submit that Borders II also fails to disclose a parallelogram joint as required by claims 7 and 9, and thus, that Borders II fails to cure the deficiencies of Borders I.

As Applicants have traversed each and every rejection and objection raised by the Examiner, Applicants respectfully request allowance of claims 7-11.

Should the Examiner withdraw the present rejections without allowing the claims, Applicants respectfully request that the Examiner withdraw the finality of the present office action.

Applicants believe no fees are due with the filing of this Response; however, if it is determined that fees are required, please charge our Deposit Account No. 13-0235.

Respectfully submitted,

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Registration No. 45,156
Attorney for Applicant(s)

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Rapid Design through Virtual and Physical Prototyping

Carnegie Mellon University

Introduction to Mechanisms

Yi Zhang
with
Susan Finger
Stephannie Behrens

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5 Planar Linkages

5.1 Introduction

5.1.1 What are Linkage Mechanisms?

Have you ever wondered what kind of mechanism causes the wind shield wiper on the front widow of car to oscillate (Figure 5-1a)? The mechanism, shown in Figure 5-1b, transforms the rotary motion of the motor into an oscillating motion of the windshield wiper.

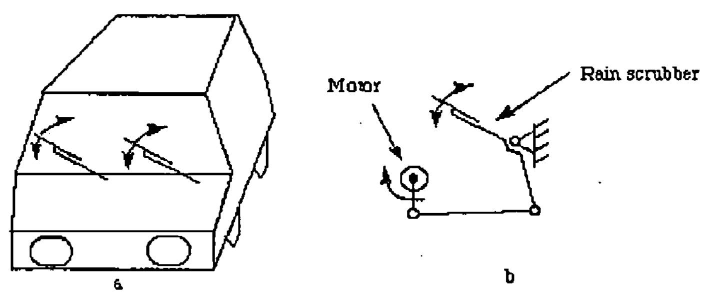

Figure 5-1 Windshield wiper

Let's make a simple mechanism with similar behavior. Take some cardboard and make four strips as shown in Figure 5-2a.

Take 4 pins and assemble them as shown in Figure 5-2b.

Now, hold the 6in. strip so it can't move and turn the 3in. strip. You will see that the 4in. strip oscillates.

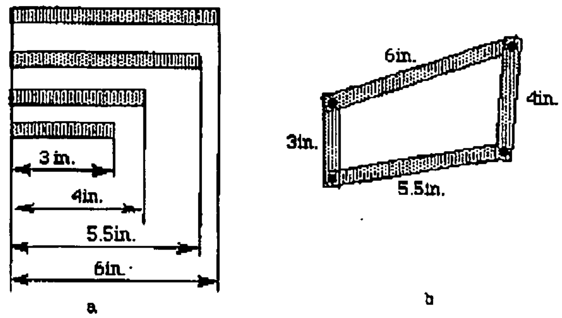

Figure 5-2 Do-it-yourself four bar linkage mechanism

The four bar linkage is the simplest and often times, the most useful mechanism. As we mentioned before, a mechanism composed of rigid bodies and lower pairs is called a linkage (Hunt 78). In planar mechanisms, there are only two kinds of lower pairs --- revolute pairs and prismatic pairs.

The simplest closed-loop linkage is the four bar linkage which has four members, three moving links, one fixed link and four pin joints. A linkage that has at least one fixed link is a mechanism. The following example of a four bar linkage was created in SimDesign in `simdesign/fourbar.sim`

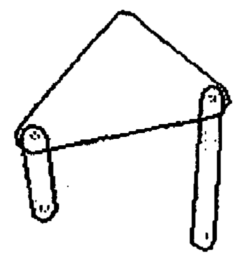

Figure 5-3 Four bar linkage in SimDesign

This mechanism has three moving links. Two of the links are pinned to the frame which is not shown in this picture. In SimDesign, links can be nailed to the background thereby making them into the frame.

How many DOF does this mechanism have? If we want it to have just one, we can impose one constraint on the linkage and it will have a definite motion. The four bar linkage is the simplest and the most useful mechanism.

Reminder: A mechanism is composed of rigid bodies and lower pairs called linkages (Hunt 78). In planar mechanisms there are only two kinds of lower pairs: turning pairs and prismatic pairs.

5.1.2 Functions of Linkages

The function of a link mechanism is to produce rotating, oscillating, or reciprocating motion from the rotation of a crank or *vice versa* (Ham *et al.* 58). Stated more specifically linkages may be used to convert:

1. Continuous rotation into continuous rotation, with a constant or variable angular velocity ratio.
2. Continuous rotation into oscillation or reciprocation (or the reverse), with a constant or variable velocity ratio.
3. Oscillation into oscillation, or reciprocation into reciprocation, with a constant or variable velocity ratio.

Linkages have many different functions, which can be classified according on the primary goal of the mechanism:

- **Function generation**: the relative motion between the links connected to the frame,
- **Path generation**: the path of a tracer point, or
- **Motion generation**: the motion of the coupler link.

5.2 Four Link Mechanisms

One of the simplest examples of a constrained linkage is the ***four-link mechanism***. A variety of useful mechanisms can be formed from a four-link mechanism through slight variations, such as changing the character of the pairs, proportions of links, *etc*. Furthermore, many complex link mechanisms are combinations of two or more such mechanisms. The majority of four-link mechanisms fall into one of the following two classes:

1. the four-bar linkage mechanism, and
2. the slider-crank mechanism.

5.2.1 Examples

Parallelogram Mechanism

In a parallelogram four-bar linkage, the orientation of the coupler does not change during the motion. The figure illustrates a loader. Obvioulsy the behavior of maintaining parallelism is important in a loader. The bucket should not rotate as it is raised and lowered. The corresponding SimDesign file is `simdesign/loader.sim`.

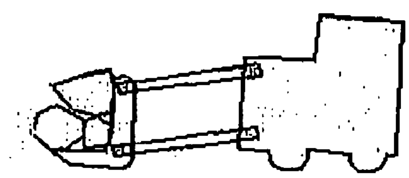

Figure 5-4 Front loader mechanism

Slider-Crank Mechanism

The four-bar mechanism has some special configurations created by making one or more links infinite in length. The slider-crank (or crank and slider) mechanism shown below is a four-bar linkage with the slider replacing an infinitely long output link. The corresponding SimDesign file is `simdesign/slider.crank.sim`.

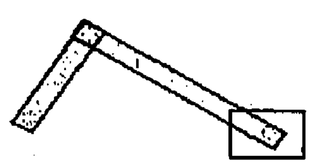

Figure 5-5 Crank and Slider Mechanism

This configuration translates a rotational motion into a translational one. Most mechanisms are driven by motors, and slider-cranks are often used to transform rotary motion into linear motion.

Crank and Piston

You can also use the slider as the input link and the crank as the output link. In this case, the mechanism transfers translational motion into rotary motion. The pistons and crank in an internal combustion engine are an example of this type of mechanism. The corresponding SimDesign file is `simdesign/combustion.sim`.

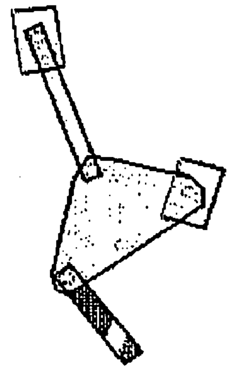

Figure 5-6 Crank and Piston

You might wonder why there is another slider and a link on the left. This mechanism has two dead points. The slider and link on the left help the mechanism to overcome these dead points.

Block Feeder

One interesting application of slider-crank is the block feeder. The SimDesign file can be found in `simdesign/block-feeder.sim`

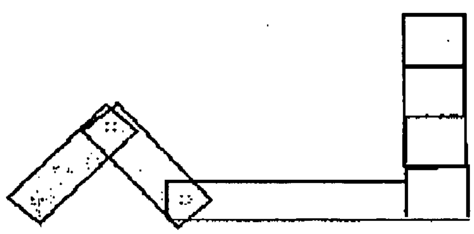

Figure 5-7 Block Feeder

5.2.2 Definitions

In the range of planar mechanisms, the simplest group of lower pair mechanisms are four bar linkages. A ***four bar linkage*** comprises four bar-shaped links and four turning pairs as shown in Figure 5-8.

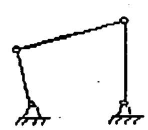

Figure 5-8 Four bar linkage

The link opposite the frame is called the **coupler link**, and the links which are hinged to the frame are called **side links**. A link which is free to rotate through 360 degree with respect to a second link will be said to **revolve** relative to the second link (not necessarily a frame). If it is possible for all four bars to become simultaneously aligned, such a state is called a **change point**.

Some important concepts in link mechanisms are:

1. **Crank**: A side link which revolves relative to the frame is called a *crank*.
2. **Rocker**: Any link which does not revolve is called a *rocker*.
3. **Crank-rocker mechanism**: In a four bar linkage, if the shorter side link revolves and the other one rocks (*i.e.*, oscillates), it is called a *crank-rocker mechanism*.
4. **Double-crank mechanism**: In a four bar linkage, if both of the side links revolve, it is called a *double-crank mechanism*.
5. **Double-rocker mechanism**: In a four bar linkage, if both of the side links rock, it is called a *double-rocker mechanism*.

5.2.3 Classification

Before classifying four-bar linkages, we need to introduce some basic nomenclature.

In a four-bar linkage, we refer to the *line segment between hinges* on a given link as a **bar** where:

- s = length of shortest bar
- l = length of longest bar
- p, q = lengths of intermediate bar

Grashof's theorem states that a four-bar mechanism has *at least* one revolving link if

$$s + l <= p + q \qquad (5\text{-}1)$$

and all three mobile links will rock if

$$s + l > p + q \qquad (5\text{-}2)$$

The inequality 5-1 is **Grashof's criterion**.

All four-bar mechanisms fall into one of the four categories listed in Table 5-1:

Case	l + s vers. p + q	Shortest Bar	Type
1	<	Frame	Double-crank
2	<	Side	Rocker-crank
3	<	Coupler	Doubl rocker
4	=	Any	Change point
5	>	Any	Double-rocker

Table 5-1 Classification of Four-Bar Mechanisms

From Table 5-1 we can see that for a mechanism to have a crank, the sum of the length of its shortest and longest links must be less than or equal to the sum of the length of the other two links. However, this condition is necessary but not sufficient. Mechanisms satisfying this condition fall into the following three categories:

1. When the shortest link is a side link, the mechanism is a crank-rocker mechanism. The shortest link is the crank in the mechanism.
2. When the shortest link is the frame of the mechanism, the mechanism is a double-crank mechanism.
3. When the shortest link is the coupler link, the mechanism is a double-rocker mechanism.

5.2.4 Transmission Angle

In Figure 5-11, if *AB* is the input link, the force applied to the output link, *CD*, is transmitted through the coupler link *BC*. (That is, pushing on the link *CD* imposes a force on the link *AB*, which is transmitted through the link *BC*.) For sufficiently slow motions (negligible inertia forces), the force in the coupler link is pure tension or compression (negligible bending action) and is directed along *BC*. For a given force in the coupler link, the torque transmitted to the output bar (about point *D*) is maximum when the angle β between coupler bar *BC* and output bar *CD* is π/2. Therefore, angle BCD is called **transmission angle**.

$$\alpha_{max} = |90° - \beta|_{min} < 50° \tag{5-3}$$

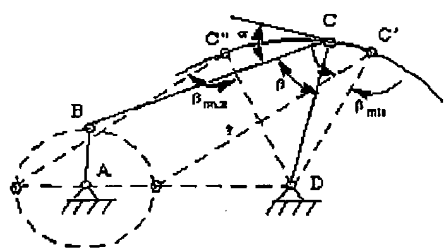

Figure 5-11 Transmission angle

When the *transmission angle* deviates significantly from π/2, the torque on the output bar decreases and may not be sufficient to overcome the friction in the system. For this reason, the **deviation angle** $\alpha=|\pi/2-\beta|$ should not be too great. In practice, there is no definite upper limit for α, because the existence of the inertia forces may eliminate the undesirable force relationships that is present under static conditions. Nevertheless, the following criterion can be followed.

5.2.5 Dead Point

When a side link such as *AB* in Figure 5-10, becomes aligned with the coupler link *BC*, it can only be compressed or extended by the coupler. In this configuration, a torque applied to the link on the other side, *CD*, cannot induce rotation in link *AB*. This link is therefore said to be at a **dead point** (sometimes called a **toggle point**).

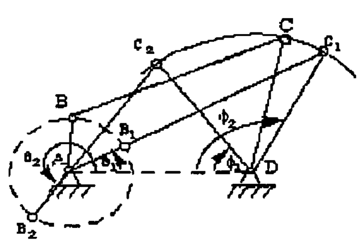

Figure 5-10 Dead point

In Figure 5-11, if AB is a crank, it can become aligned with BC in full extension along the line AB_1C_1 or in flexion with AB_2 folded over B_2C_2. We denote the angle ADC by ϕ and the angle DAB by θ. We use the subscript 1 to denote the extended state and 2 to denote the flexed state of links AB and BC. In the extended state, link CD cannot rotate clockwise without stretching or compressing the theoretically rigid line AC_1. Therefore, link CD cannot move into the *forbidden zone* below C_1D, and ϕ must be at one of its two extreme positions; in other words, link CD is at an extremum. A second extremum of link CD occurs with $\phi = \phi_1$.

Note that the extreme positions of a side link occur simultaneously with the dead points of the opposite link.

In some cases, the dead point can be useful for tasks such as work fixturing (Figure 5-11).

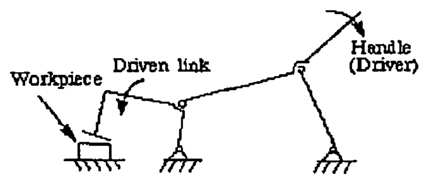

Figure 5-11 Work fixturing

In other cases, dead point should be and can be overcome with the moment of inertia of links or with the asymmetrical deployment of the mechanism (Figure 5-12).

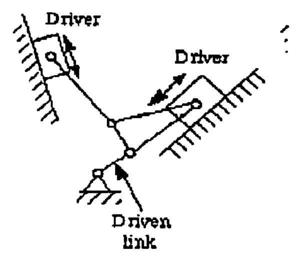

Figure 5-12 Overcoming the dead point by asymmetrical deployment (V engine)

5.2.6 Slider-Crank Mechanism

The slider-crank mechanism, which has a well-known application in engines, is a special case of the crank-rocker mechanism. Notice that if rocker 3 in Figure 5-13a is very long, it can be replaced by a block sliding in a curved slot or guide as shown. If the length of the rocker is infinite, the guide and block are no longer curved. Rather, they are apparently straight, as shown in Figure 5-13b, and the linkage takes the form of the ordinary **slider-crank mechanism**.

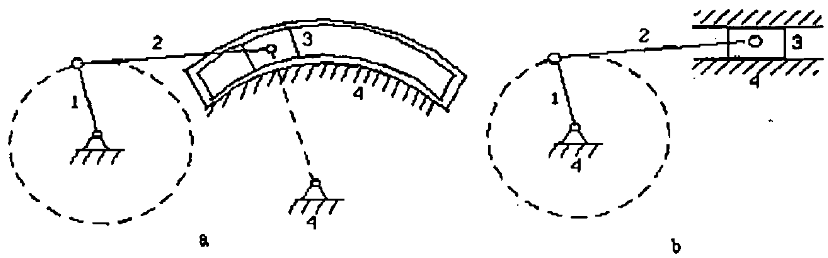

Figure 5-13 Slider-Crank mechanism

5.2.7 Inversion of the Slider-Crank Mechanism

Inversion is a term used in kinematics for a reversal or interchange of form or function as applied to kinematic chains and mechanisms. For example, taking a different link as the fixed link, the slider-crank mechanism shown in Figure 5-14a can be inverted into the mechanisms shown in Figure 5-14b, c, and d. Different examples can be found in the application of these mechanisms. For example, the mechanism of the pump device in Figure 5-15 is the same as that in Figure 5-14b.

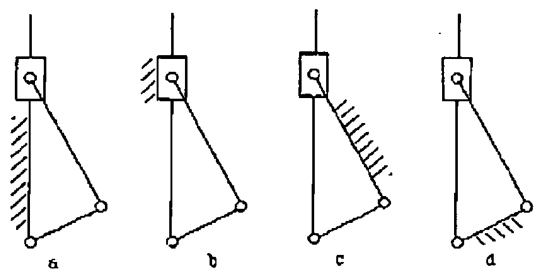

Figure 5-14 Inversions of the crank-slide mechanism

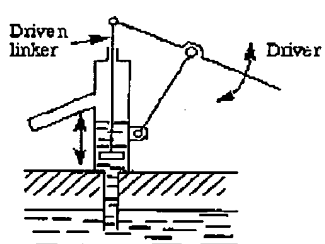

Figure 5-15 A pump device

Keep in mind that the inversion of a mechanism does not change the motions of its links relative to each other but does change their absolute motions.

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US005374050A

United States Patent [19]

Prim

[11] Patent Number: 5,374,050

[45] Date of Patent: Dec. 20, 1994

[54] JOGGER HAVING A FLOATING MOUNT

[75] Inventor: John E. Prim, West Chazy, N.Y.

[73] Assignee: Prim Hall Enterprises, Inc., Plattsburgh, N.Y.

[21] Appl. No.: 71,530

[22] Filed: Jun. 3, 1993

[51] Int. Cl.[5] B65H 31/36

[52] U.S. Cl. 271/221; 271/223; 414/917

[58] Field of Search 271/149, 150, 213, 221, 271/222, 223; 414/917

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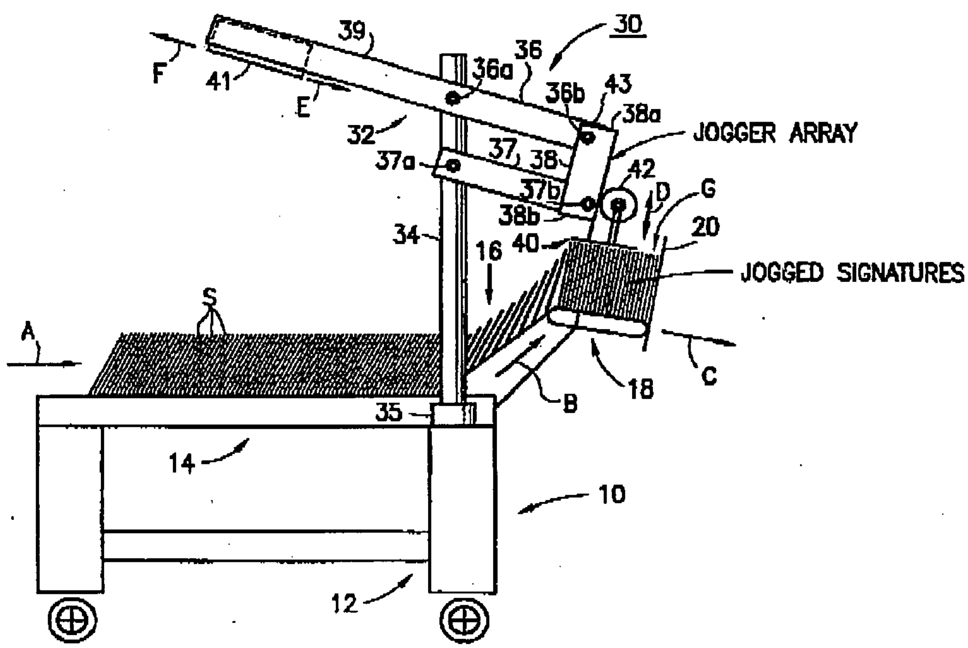
5,203,837	4/1993	Madic et al.	414/917 X

Primary Examiner—Robert P. Olszewski
Assistant Examiner—Boris Milef
Attorney, Agent, or Firm—Louis Weinstein

[57] ABSTRACT

A jogger having a jogger plate is floatingly supported by a four-bar linkage swingably mounted upon a support post. The four-bar linkage is a parallelogram-type linkage which enables the jogger plate to maintain its orientation in space regardless of any swinging movement experienced by the parallelogram linkage. An adjustable weight is provided to control the force exerted upon a signature stack during operation. The jogger plate is adjustable to provide proper positioning of the plate relative to the stack being jogged into alignment. Sensors control the operation of the jogger assembly responsive to the presence of a stack to be jogged and responsive to the movement of the jogging assembly to a given position displaced from the nominal operating position.

20 Claims, 5 Drawing Sheets



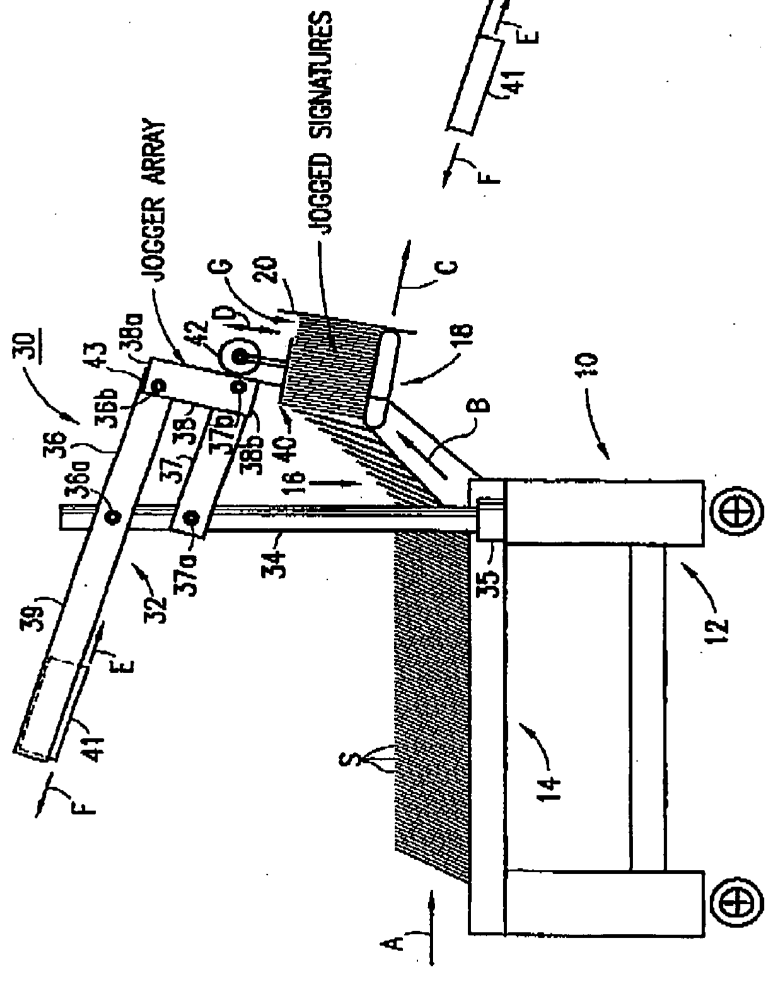


Fig. 1

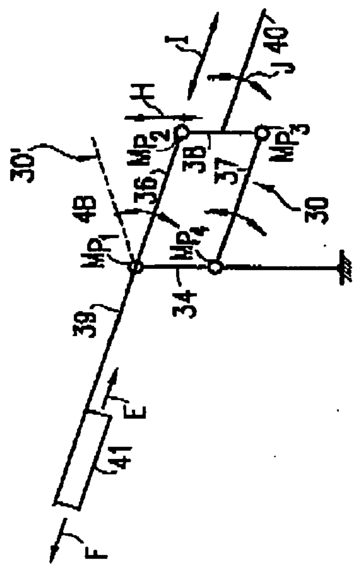
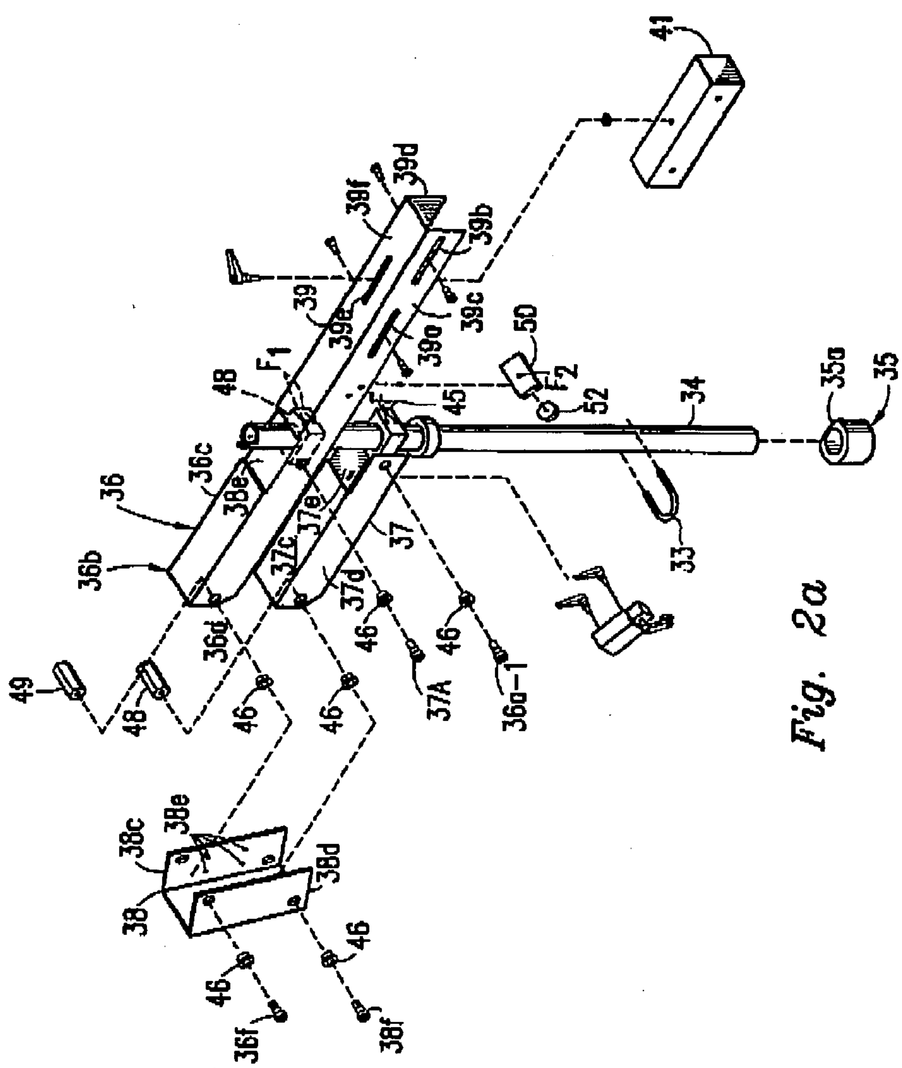


Fig. 1a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F1
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Fig. 2a

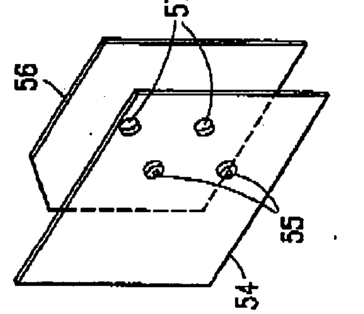
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Fig. 2c

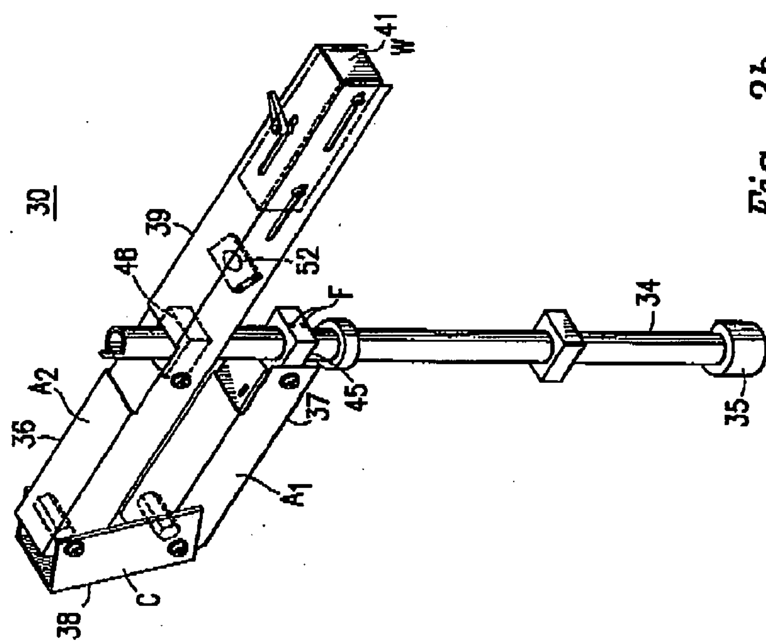
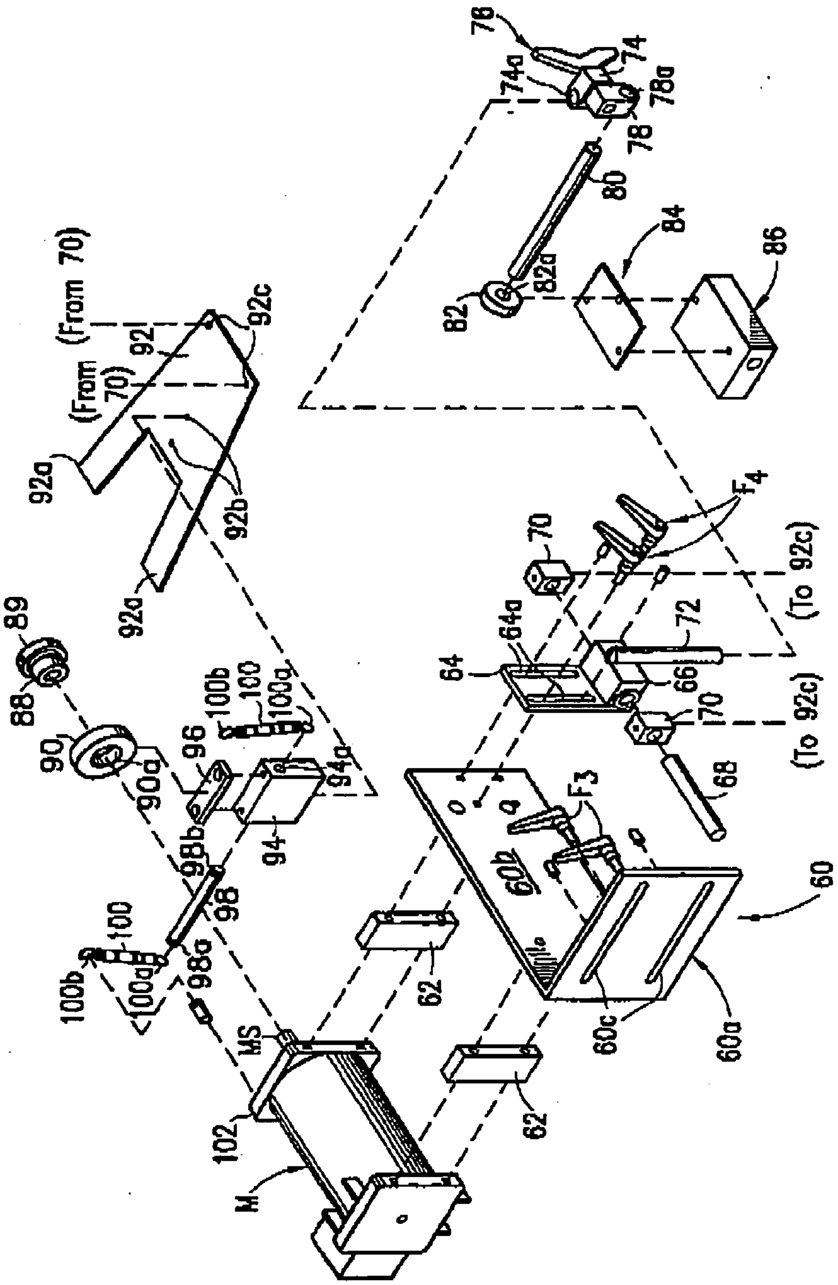


Fig. 2b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74a
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78a
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86
82
82a
(From 70)
(From 70)
92
92c
92a
92b
92a
F4
70
(To 92c)
72
64a
64
66
70
(To 92c)
68
89
88
90
90a
100b
100
100a
96
94a
94
98b
98
F3
60b
60
100
98a
100b
100a
62
MS
60c
60a
102
62
M

Fig. 3a

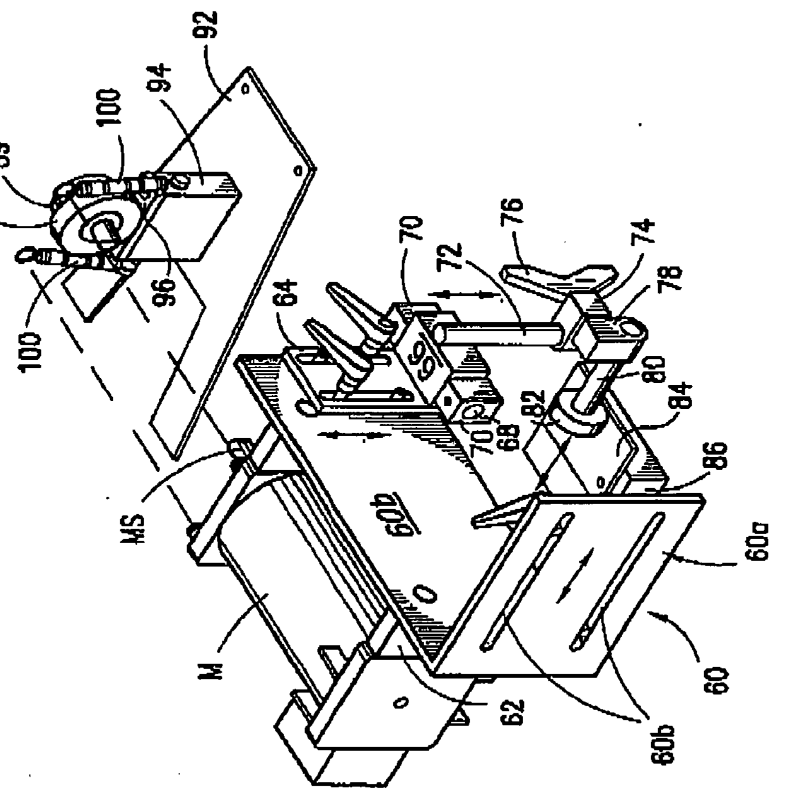
92
94
100
89
90
96
100
70
72
76
74
78
64
66
80
84
82
68
70
86
MS
60b
M
60a
60
62
60b

Fig. 3b

JOGGER HAVING A FLOATING MOUNT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to copending application Ser. No. 978,994, filed Nov. 19, 1992, now U.S. Pat. No. 5,310,172, and application Ser. No. 693,638, filed Apr. 30, 1991, now U.S. Pat. No. 5,197,590, issued Mar. 30, 1993, both of said documents being assigned to the assignee of the present invention.

FIELD OF THE INVENTION

The present invention relates to joggers and more particularly to a novel floating mount for devices such as joggers for regulating the force applied to the top edges of signatures being jogged into alignment and preventing signatures from being curled.

BACKGROUND OF THE INVENTION

Vertical hopper loaders are well known in the art and are typically used in the printing and publishing field and are utilized to form neatly aligned stacks of signatures preparatory to being fed to saddle conveyors, bindery machines and the like. One typical hopper loader which may use the present invention to great advantage is described in copending application Ser. No. 978,994, filed Nov. 19, 1992 and assigned to the assignee of the present invention. For purposes of understanding the present invention, the vertical hopper loader of application Ser. No. 978,994, receives stacks of signatures typically manually placed upon a first, horizontal conveyor section. The signatures are tilted over so as to be substantially diagonally aligned and in a near-vertical position and are thereafter moved along a diagonally aligned conveyor path formed by a ramp conveyor section which causes the signatures to be fed in a shingle fashion at a speed which is the same as or faster than the speed of the horizontal conveyor with the folded edges extending upwardly and being spaced by an increased distance from the folded edge of adjacent signatures due to the diagonally upward movement. The conveyor path then changes whereupon the lower edges of the signatures are moved along a third, short conveyor path aligned so as to move the lower edges of the signatures either horizontally or diagonally downwardly toward a collection device typically inclined at an acute angle to the vertical.

As the signatures are advanced along the third, short conveyor path by virtue of a conveyor means engaging and driving the bottom edges of the signatures engaging the conveyor means to advance the signatures to the output utilization device, it is advantageous to provide a jogging means for jogging the top edges of the signatures to form a neat stack preparatory to delivery to the output utilization means to assure proper feeding.

Jogging is typically accomplished by employment of jogging means such as a beaver-tail jogger described in the aforementioned U.S. Pat. No. 5,197,590. Such beaver-tail joggers are adjustable, typically in at least two mutually perpendicular directions, to adjust the beaver-tail plate which undergoes oscillation to jog the stack of signatures therebeneath by repeated engagement with the upper folded edges of the signatures as they move along the third conveyor path.

Conventional beaver-tail joggers of the type described in U.S. Pat. No. 5,197,590 have the disadvantage of being substantially fixed in space, once adjusted, so that signatures may be damaged or unnecessarily curled and/or the beaver-tail jogger drive assembly may be overloaded and possibly damaged due to changes in the nominal position of the top folded edges of the signatures.

BRIEF DESCRIPTION OF THE INVENTION

The present invention is characterized by comprising a novel four-bar parallelogram-type linkage assembly for floatingly mounting jogger assemblies and the like. The jogger assembly is swingably mounted upon a support post which serves as one "bar" of the four-bar assembly. First ends of a second "bar" and a third "bar" are swingably mounted to said post and a fourth "bar" has its ends pivotally coupled to the free ends of said second and third bars. A jogger assembly is coupled to the fourth bar by adjustable means for adjusting the position and angular orientation of the beaver-tail jogging plate relative to the top folded edges of a stack of forming signatures.

The aforementioned second bar is provided with an extension that extends away from the jogger assembly and which is provided with a mass which is movable along a slidable mount provided on the extension and includes releasable fastening means for maintaining the slidable mass in a predetermined position, said slidable mass at least partially counterbalancing the weight of the jogger assembly by an amount which is a function of weight of the mass and the position of the slidable mass along the extension rod.

Once the jogging plate is positioned at the desired orientation, the four-bar linkage assures that the jogging plate thereafter remains parallel to its original orientation regardless of any swinging movement up or down experienced by the linkage assembly. The weight or force of the jogging plate upon the top folded edges of the signatures is dynamically adjusted in the event that any changes occur in the position or positions of the top folded edges of signatures conveyed to the third and final conveying path of the hopper loader. This arrangement also operates as a safety feature which permits movement of the jogger assembly responsive to any impediment which may strike or be struck by the jogger plate and/or jogger.

Adjustably mounted sensing means is provided to activate the jogger assembly only in the presence of a signature stack to be jogged. Further sensing means are provided to deactivate the jogger assembly when the jogging assembly is lifted to a given position displaced from the nominal stack jogging position.

OBJECTS OF THE INVENTION

It is therefore one object of the present invention to provide a novel mounting assembly for floatingly mounting jogging assemblies and the like.

Still another object of the present invention is to provide a novel four-bar linkage for floatingly mounting jogger assemblies and the like.

Still another object of the present invention is to provide a novel mounting assembly for floatingly mounting beaver-tail joggers and the like.

Still another object of the present invention is to provide a novel assembly for floatingly mounting joggers, jogger assemblies and the like and incorporating a slidably mounted mass for adjusting the force exerted by the jogger assembly upon a stack of signatures being formed on an outfeed conveyor.

The above, as well as other objects of the present invention will become apparent when reading the accompanying description and drawings, in which:

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a simplified elevational view of a vertical hopper loader incorporating the floating top jogger assembly of the present invention;

FIG. 1a shows a simplified, diagrammatical view of the jogger mounting assembly of FIG. 1 which is useful in explaining the manner in which the orientation of the jogger assembly jogger plate is maintained regardless of swinging movement of the mounting assembly;

FIG. 2a is a detailed exploded perspective view of the support assembly of FIG. 1;

FIG. 2b is a detailed assembled perspective view of the support assembly of FIG. 2a;

FIG. 2c is a perspective view of guard plates employed with the floating support assembly of FIG. 2a; and

FIGS. 3a and 3b are exploded perspective and assembled perspective views of the jogger assembly.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS THEREOF

FIG. 1 shows a simplified view of a vertical hopper loader 10 which includes a wheeled support frame 12 having a first substantially horizontally aligned conveyor section 14 for conveying signatures S in the direction shown by arrow A. A hopper loader suitable for use with the present invention is described in detail in U.S. Pat. No. 5,197,590 and incorporated herein reference thereto.

Stacks of signatures are typically manually placed upon the first conveyor section with their folded edges up. The signatures are maintained in a substantially diagonal alignment and move in the direction of arrow A toward a second conveyor section 16 which moves the signatures diagonally upward and to the right as shown by directional arrow B. Movement of signatures S along conveyor path 16 serves to separate adjacent signatures from one another preparatory to their movement to the final output conveyor section 18 which supports and engages the folded edges of signatures S with the cut edges being substantially aligned along the assured through the use of jogger assembly 30 which employs a jogging plate 40 reciprocated by a drive motor 42 to move in the direction shown by double-headed arrow D to jog the top folded edges of signatures in group G as they are advanced in the direction shown by arrow C along conveyor section 18, thus, assuring that the top folded edges are substantially in perfect alignment preparatory to reaching limit plate 20.

Heretofore, jogger assemblies employing a jogging plate utilized adjustment means for adjusting the jogging plate according to the angular orientation as well as the distance of the jogging plate above the surface of conveyor section 18, which is a function of the height of the signatures being collected. One such jogger assembly and the adjustment means therefor is described in the aforementioned U.S. Pat. No. 5,197,590.

The present invention provides a novel floating assembly 30 which is of a four-bar linkage type and is comprised of a support post 34 having its lower end secured to the hopper loader support structure by suitable support means 35. A pair of "bars" 36 and 37 are swingably mounted to post 34 by pivots at their ends 36a, 37a. A fourth "bar" 38 has its upper end 38a pivotally coupled by suitable coupling means 36f, 46 to the free end 36b of bar 36 (see FIG. 2a). The lower end 38b of bar 38 is pivotally coupled by coupling means 38f, 46 to the right-hand, free end 37b of bar 37 (see FIG. 2a).

Bar 36 is provided with an extension 39 extending to the left of support post 34 and provided with a mass 41 which is mounted to slide in either of the two directions shown by arrows E, F. Releasable fastening means (to be more fully described) serve to maintain mass 41 at any desired position along the permissible length of travel provided by means to be more fully described.

Adjustment means, to be more fully described, permit adjustment of the jogging plate shown by double-headed arrows H, I and J in FIG. 1a.

Assuming the orientation of the plate 40 to be as shown in FIG. 1a, the novel operation of the four-bar linkage is as follows:

Omitting the description of extension bar 39 and slidable mass 41 for the moment, the pivotal mounts MP_1 through MP_4 provided to swingably mount each of the bars to at least two associated adjacent bars cause the assembly to swing clockwise about the pivotal mounts